Fumes and Gases

INTRODUCTION

Many welding, cutting, and allied processes produce fumes and gases, which may be harmful to your health.

- Fumes are solid particles which originate from welding consumables, the base metal, and any coatings present on the base metal.

- In addition to shielding gases that can be used, gases are produced during the welding process or may be produced by the effects of process radiation on the surrounding environment.

- Familiarize yourself with the effects of these fumes and gases by reading the Safety Data Sheets (SDSs) for all materials used (consumables, base metals, coatings, and cleaners).

- For help, consult a qualified person such as an industrial hygienist.

- The amount and composition of welding fumes and gases depend upon the composition of the filler metal and base material, welding process, current level, arc length, and other factors.

POSSIBLE EFFECTS OF OVER-EXPOSURE

- Depending on the material involved, the effects range from irritation of eyes, skin, and respiratory system to more severe complications.

- Effects can occur immediately or at some later time.

- Fumes can cause symptoms such as nausea, headaches, dizziness, and metal fume fever. Welding fume is on the International Agency for Research on Cancer (IARC) list as posing a cancer risk to humans.

- The possibility of more serious health effects exists when toxic materials are involved. For example, manganese overexposure can affect the central nervous system resulting in impaired speech and movement.

- In confined spaces the gases might displace breathing air and cause asphyxiation (see Fact Sheet No. 11).

HOW TO AVOID OVEREXPOSURE

- Keep your head out of the fumes.

- Do not breathe the fumes.

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- Keep food and drinks out of work area.

- Wash hands before eating, drinking, smoking or vaping.

- Use enough ventilation or localized exhaust at the arc, or both, to keep fumes and gases from your breathing zone and general area.

- In some cases, natural air movement provides enough ventilation and fresh air.

- Where ventilation is questionable, have a qualified person such as an industrial hygienist determine the need for corrective measures.

- Use mechanical ventilation to improve air quality.

- If engineering controls are not adequate to prevent overexposures, use proper respiratory protection (see Fact Sheet No. 38).

- Whenever the following materials are identified as other than trace constituents in welding, brazing, or cutting operations, and unless breathing zone sampling under the most adverse conditions has established that the level of hazardous constituents is below the allowable limits specified by the authority having jurisdiction, special ventilation precautions shall be taken: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Galvanized Metal, Copper, Lead, Manganese, Mercury, Nickel, Ozone, Selenium, Silver, Vanadium. See section 5.5, Special Ventilation Concerns, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes.*

- Work in a confined space only if it is well ventilated, or while wearing a supplied air respirator (SAR). Fumes from welding or cutting and oxygen depletion can alter air quality causing injury or death. Be sure the breathing air is safe.

- Follow Occupational Safety and Health Administration (OSHA) guidelines for permissible exposure limits (PELs) for constituents and degradation by products listed in the Safety Data Sheets (SDS).

- Follow the American Conference of Governmental Industrial Hygienists (ACGIH) recommendations for threshold limit values (TLVs) for constituents and degradation byproducts listed in the Safety Data Sheets (SDS).
- Have a qualified person such as an industrial hygienist check the operation and air quality and make recommendations for the specific welding or cutting situation.

INFORMATION SOURCES

ACGIH, *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,* American Conference of Governmental Industrial Hygienists, <www.acgih.org>.

ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes,* American Welding Society, <www.aws.org>.

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AWS F3.2, *Ventilation Guide for Weld Fume*, American Welding Society, <www.aws.org>.

AWS, *Fumes and Gases in the Welding Environment* and other welding related safety and health publications, American Welding Society, <www.aws.org>.

AWS, *Safety and Health Fact Sheets,* American Welding Society, <www.aws.org>.

MSHA, *Title 30, Mineral Resources, Parts 1 to 199*, *Mine Safety and Health Administration*. *Code of Federal Regulations (CRF),* <www.msha.gov>.

NIOSH, Publication 2019-174, *A Guide to Atmosphere-Supplying Respirators,* National Institute for Occupational Safety and Health, <www.cdc.gov/niosh>.

OSHA, *Title 29 Labor, Parts 1910.1 to 1910.1450*, Occupational Safety and Health Administration. Code of Federal Regulations (CFR), <www.osha.gov>.

For specific information, refer to the applicable Safety Data Sheet (SDS) available from the manufacturer, distributor, or supplier.